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distant, yielded, as already remarked, only ·4 per 10,000, part of which was sulphate, part carbonate of lime.

By certain management, I am informed, as by not allowing the sea-water in the boilers to be concentrated beyond a certain degree, the incrustation, in the instances of the transatlantic steamers, is in a great measure prevented. Perhaps it might be prevented altogether, were sea-water never used but with this precaution, and taken up at a good distance from land, and in situations where it is known that the proportion of sulphate of lime is small. If this suggestion be of any worth, further, more extensive and exact inquiry will be requisite to determine the proportion of sulphate of lime in different parts of the ocean, and more especially towards land. By the aid of the transatlantic steam navigation companies means for such an inquiry may easily be obtained; and it can hardly be doubted that the results will amply repay any cost or trouble incurred.

Lesketh How, Ambleside,
March 29, 1849.

2. "On the Universal Law of Attraction, including that of Gravitation, as a particular case of approximation deducible from the principle that equal and similar particles of matter move similarly, relatively to each other." By John Kinnersley Smythies, Esq. Communicated by T. F. Ellis, Esq., F.R.S.

After stating the general object of his investigations and explaining the notation he employs, the author enters upon some preliminary geometrical inquiries. He gives the equation between the six right lines drawn between four points in a plane; the solidity of a tetrahedron in terms of its edges: the equation between the cosines of the six angles made by four right lines meeting in a point; and the equation between ten right lines drawn between five points, with some formulæ of verification. Giving some general rules for the transformation and consolidation of series, he transforms the last equation into one involving the solidities of tetrahedrons, and shows how the sign of each tetrahedron in that equation is determined by its position relatively to the least solid including them all; and then gives the equation between all the right lines drawn between n points.

Having shown that the result of differentiating the product of n variables, m times successively may be derived from the mth power of the sum of the n variables, developed by the polynomial theorem by substituting for every power of each variable its differential of an order numerically the same as the power; and applied the theorem to find the differential of the mth order of the equation between ten right lines drawn between five points; the author gives the first four successive differentials of the same equation in another form.

Proceeding with his investigation he deduces the necessary equation between the distances and central forces of five moving points, and derives from it the general system of equations which determine the motion of any number of spheres in terms of φ (the function of the distance according to which the attractive force varies), their

masses and mutual distances. After proving that any number of spheres may move so that the central force shall vary directly as the distance, he shows that only certain values of φ are possible for an infinite number of spheres, giving the criterion of possibility; and thence that the only possible law of central force for an infinite number of spheres is that in which the force varies directly as the distance.

The author then enters upon some general considerations on the physical impossibility of an universal law, rigorously exact and expressed by equations involving differentials of no higher order than the second, and on the amount of disturbance by extraneous agencies. Having shown how all equations expressed by rectangular coordinates may be transformed into others involving only the mutual distances of the spheres at m equal intervals of time, he gives an equation of differences defining the motion of n points, such that the distances and their differentials of every order not exceeding m may have any assigned values.

After deducing a general formula for transforming equations of differences not exceeding the mth order into equations between the distances at m equal intervals of time, the author applies it to the last equation, and shows that the equations so found are possible for any number of moving points and for every value of m; and that the most general law, by which the motion of n equal spheres can be determined, so that all move according to the same law at all times, may be found by taking a proper value of m. He then shows that these equations give a method of unlimited approximation to any unknown law; and suggests the mode of extending the solution of the problem to solids of any figure and mass. Finally, he gives the mth differential of the distance between any pair of points moving according to this law, in terms of the differentials of lower orders including the distances.

June 21, 1849.

The EARL OF ROSSE, President, in the Chair.

The following Gentlemen were admitted into the Society:—

Sir Robert Kane, M.D.; Thomas Andrews, M.D.; John Scott Russell, Esq.

The Right Rev. The Lord Bishop of Manchester was elected into the Society.

The following papers were read:—

1. "On the Anatomy and Affinities of the Family of Medusæ." By Henry Huxley, Esq. Communicated by the Bishop of Norwich, F.R.S.

The author commences by remarking that no class of animals has been so much investigated with so little satisfactory and comprehensive result as the family of *Medusæ* (including under that name the *Medusæ*, *Monostomatæ* and the *Rhizostomidæ*), and proposes in this